U. S. FOREST SERVICE

RESEARCH NOTE NC-214

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

Folwell Avenue, St. Paul, Minnesota 55108

HYPOXYLON CANKER OF ASPEN ASSOCIATED WITH SAPERDA INORNATA GALLS

1976

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ABSTRACT.--Preliminary findings from a study to gain information on the infection process and genetics of resistance of the Hypoxylon canker fungus (Hypoxylon mammatum) on aspen (Populus tremuloides) indicate that the poplar-gall Saperda (Saperda inornata) may be involved. This paper describes the types of wounds made by the insect and how these and resulting Hypoxylon infections in the study plantation resemble the observed pattern of infections in the field.

OXFORD: 443:416.13. KEY WORDS: Populus tremuloides, poplar-gall Saperda, Hypoxylon mammatum, oviposition wounds.

Hypoxylon canker, caused by Hypoxylon mammatum Wahl. Mill., causes annual losses of more than 1 million cords of quaking aspen (Populus tremuloides Michx.) in Minnesota, Wisconsin, and Michigan (Anderson 1964). The means by which the fungus infects the tree is unknown and remains one of the major obstacles to the possible control of this disease.

In an attempt to gain information on the infection process and the genetical control of host resistance to this disease, three plantations consisting of aspen from controlled crosses have been established. These crosses involved parent trees that were cankered and noncankered and were selected over the geographic range of aspen in Minnesota. Beginning in 1966, crosses were made each spring and approximately 15 progenies plus the parents, established by root cuttings, were planted at 3 locations: Rosemount and Pike Bay, Minnesota,

and Langlade, Wisconsin. The results of the work at Rosemount, Minnesota, are reported here.

The plantation consists of 574 trees resulting from 41 different crosses. The trees were planted at a 10- by 10-foot spacing and now range in height from 4 to 25 feet. The nearest wild aspen stands are 0.5 and 2.3 miles from the plantation and only the latter stand contained some trees infected by H. mammatum. The plantation trees were observed each month throughout the growing season. So far, 13 Hypoxylon cankers have been positively identified. A Hypoxylon canker is considered "positive" when hyphal pegs releasing conidia or stroma-producing ascospores are found on a canker. All cankers were the result of natural infection and no artificial inoculation or wounding of any kind has been attempted.

All but one of the cankers was associated with an insect gall caused by Saperda inornata = (S. concolor). Manion (1975) also reported Hypoxylon cankers associated with this insect in New York. In several cases, hyphal pegs of the Hypoxylon fungus formed on the small branch near the gall. However, in most cases, the fungus produced spores after it had grown from the site of the gall down the branch and into the main stem of the tree.

The poplar-gall Saperda lays eggs in aspen branches usually less than 3/4 inch in diameter. Typical Cerambycid exit holes were noted on many galls. The branch is weakened at the site of the gall and is easily broken by the wind. The gall results from the deposition of eggs by the adult beetle and the subsequent development of the insect in the aspen branch. Shield- or u-shaped ovipositing scars are characteristic of this beetle. In the Rosemount plantation adult beetles emerged the first week of June, 1976, and at the same time hyphal pegs were being formed by the Hypoxylon fungus. The S. inornata infestation was first noted in August, 1973, on 1- to 3-year-old trees. These insect galls were the result of egg-laying activity the previous year.

Sixty additional "Hypoxylon-like cankers have begun at the insect galls and have as yet not produced spores typical of the Hypoxylon canker fungus. These cankers are similar to those reported by Nord and Knight (1972) which were also associated with S. inornata on aspen in Michigan. Several cankers have been noted resembling "Nectria" or "Ceratocystis" type cankers of aspen and these also appear to have begun in branch galls of this same insect.

The percentage of trees with positive Hypoxylon cankers is 2.26 and compares with infection data of aspen in natural stands. Many of the "Hypoxylon-like" branch cankers apparently will not migrate to the main stem as the branch often becomes too dry for fungus growth.

Since these observations were made on trees at the Rosemount, Minnesota, plantation, Hypoxylon cankers that appear to have started in S. inornata galls have been found on wild aspen trees in other areas of the State and also at the Langlade, Wisconsin, plantation.

The "typical Hypoxylon canker" with a central dead branch stub is a symptom familiar to foresters and researchers who have studied this disease. Also, it has been noted that, in general, the older the tree the higher the canker is on the main stem (Day and Strong 1959). Infection has long been suspected to have involved in some way the branch stub associated with most cankers.

Evidence from this study indicates that Hypoxylon infection can take place in insect galls on small branches or on main stems of small trees. The fungus grows down the branch and into the main stems and the branch is broken off at the gall resulting in the dead branch stub. While there are probably other means of infection, the one reported here associated with the S. inornata gall fits the pattern of Hypoxylon canker on aspen so commonly observed in Minnesota, Wisconsin, and Michigan.

Much remains to be learned about the infection process and the role of vectors in this insect-fungus-host relation. Also there are indications of insect resistance among the various aspen crosses. This type of resistance will be valuable in attempts to obtain insect and disease resistant aspen.

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